

Title: Effect of molybdenum content on phase transformations in binary Ti-Mo alloys

Author: Veronika Valešová

Department: Department of Physics of Materials

Supervisor: PhDr. RNDr. Josef Stráský, Ph.D., Department of Physics of Materials

Abstract: β titanium alloys are highly appreciated group of structural materials. They provide an extraordinary combination of strength, toughness and fatigue resistance. These alloys are used predominantly in aerospace sector, chemical industry and medical engineering.

We have studied three binary titanium alloys: *Ti-12Mo*, *Ti-15Mo* and *Ti-18Mo* (wt %). Apart from low temperature hexagonal close packed α phase and high temperature base centered cubic β phase, a metastable ω phase can be also found in this type of alloys. The ω phase is created in a diffusionless process by shifting the planes in the β phase and affects both mechanical properties and the α phase precipitation.

We have examined the phase transformations occurring in the studied alloys using both in-situ and ex-situ methods. Resistometry, dilatometry and differential scanning calorimetry were used as the indirect in-situ methods. For the ex-situ methods, scanning electron microscopy and microhardness measurement were used.

Complex characterization of β metastable titanium alloys showed the formation of the ω_{iso} phase and, in the *Ti-12Mo* alloy, precipitation of the α phase during heating. Dilatometry and resistometry are particularly sensitive to the development of the ω_{iso} phase. Its origin was also captured in DSC curves. SEM observations of samples after isothermal annealing showed the formation of the ω_{iso} phase and the α phase in all studied alloys. The increasing content of the β stabilizing element, molybdenum, suppresses the formation of the ω_{iso} phase and the α phase during short-term annealing.

Keywords: metastable β titanium alloys, phase transformations, precipitation, microhardness